THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An optical switch having N switch ports for switching DWDM optical signals, said optical switch comprising:

N bidirectional signal processors, including at least one associated with each of said N ports, for splitting and combining optical signals, wherein an optical signal passing in one direction through any one of said bidirectional signal processors is split into K parallel optical signals and wherein one or more optical signals passing through any one of said bidirectional signal processors in the other direction are emitted as a single optical signal, said one direction being oriented into said switch and said other direction being oriented out of said switch;

at least K signal delivery matrices, each of said signal delivery matrices having N matrix ports and broadcasting one of said K optical signals from any one of said N matrix ports to all other of said N matrix ports; and

a plurality of bidirectional signal selectors, at least one located between each one of said bidirectional signal processors and a respective matrix port to manage the optical signals being broadcast through said switch between said N switch ports by selecting or deselecting one or more signal components from each of said K optical signals.

2. An optical switch as claimed in claim 1 wherein said bidirectional signal processors are passive splitters wherein an optical signal is divided into K informationally identical signals having a power of 1/K times an input power less any power loss arising as said optical signals pass through said signal processor.

3. An optical switch as claimed in claim 1 wherein said bidirectional signal processors are active splitters including a power amplifier

wherein each of said split signals has a power equal to a predetermined power.

4. An optical switch as claimed in claim 3 wherein said power amplification is sufficient to permit each of said K signals to have a power similar to an input power level.

5. An optical switch as claimed in claim 3 wherein said power amplification is provided by an erbium doped amplifier.

6. An optical switch as claimed in claim 1 wherein said bidirectional signal selectors select and deselect predetermined wavelengths.

7. An optical switch as claimed in claim 1 wherein said bidirectional signal selectors include a means for demultiplexing and multiplexing said DWDM optical signals.

8. An optical switch as claimed in claim 1 further including a control system for controlling said bidirectional signal selectors.

9. An optical switch as claimed in claim 8 wherein said control system receives control information from a network, and utilizes said control information to control said bidirectional signal selectors.

10. An optical switch as claimed in claim 9 wherein said control information includes information about one or more of polarization, power and wavelength.

11. An optical switch as claimed in claim 8 wherein said control system includes a set of desired signal properties against which measured signal properties may be compared.

12. An optical switch as claimed in claim 1 wherein each of said K signal delivery matrices comprises:

a symmetrical signal splitter having three connections associated with each of said N matrix ports wherein an input signal received by any one connection is split into two equal and parallel signals each of which passes out of said symmetrical signal splitter through the remaining two connections, and

a means for bidirectionally amplifying optical power interposed between each of said symmetrical splitters for boosting a power of each of said split signals as said split signals pass through the optical amplifier to get to the next matrix port sufficiently to substantially equal a power of an input signal received by said symmetrical splitter.

13. An optical switch as claimed in claim 12 wherein said bidirectional signal processors are active splitters including an optical amplifier wherein each of said split signals has a power equal to a predetermined power.

14. An optical switch as claimed in claim 13 wherein said power amplification is sufficient to permit each of said K signals to have a power similar to an input power level.

15. An optical switch as claimed in claim 13 wherein said power amplification is achieved by an erbium doped optical amplifier.

16. An optical switch as claimed in claim 12 wherein said bidirectional signal selectors select and deselect predetermined wavelengths.

17. An optical switch as claimed in claim 12 further including a control system for controlling said bidirectional signal selectors.

18. An optical switch as claimed in claim 17 wherein said control system receives control information from a network, and utilizes said control information to control said bidirectional signal selectors.

19. An optical switch as claimed in claim 18 wherein said control information includes information about one or more of polarization, power and wavelength.

20. An optical switch as claimed in claim 18 wherein said control system includes a set of desired signal properties against which measured signal properties may be compared.

21. An optical switch as claimed in claim 1 wherein each of said K signal delivery matrices comprises:

at least one second bidirectional signal processor for splitting and combining optical signals associated with each of said bidirectional signal selectors, wherein an optical signal passing in one direction through said bidirectional signal processors is split into (N-1) parallel signals and wherein one or more optical signals passing through said bidirectional signal processor in the other direction are emitted as a single signal, said one direction being oriented into said matrix and said other direction being oriented out of said matrix;

an optical connection for each of said (N-1) signals between each of said second bidirectional signal processors and each other matrix port; and

a first optical amplifier associated with said switch to amplify a power of the optical signals being switched by a predetermined amount.

22. An optical switch as claimed in claim 21 wherein said bidirectional signal processors are active splitters each including a second optical amplifier wherein each of said split signals has a power equal to a predetermined power.

23. An optical switch as claimed in claim 21 wherein said first optical amplifier is sufficient to permit each of said K signals to have a power similar to an input power level.

24. An optical switch as claimed in claim 23 wherein said first optical amplifier is achieved by an erbium doped optical amplifier.

25. An optical switch as claimed in claim 24 wherein said bidirectional signal selectors select and deselect predetermined wavelengths.

26. An optical switch as claimed in claim 21 further including a control system for controlling said bidirectional signal selectors.

27. An optical switch as claimed in claim 26 wherein said control system receives control information from a network, and utilizes said control information to control said bidirectional signal selectors.

28. An optical switch as claimed in claim 27 wherein said control information includes information about one or more of polarization, power and wavelength.

29. An optical switch as claimed in claim 26 wherein said control system includes a set of desired signal properties against which measured signal properties may be compared.

30. An optical switch as claimed in claim 1 wherein there are provided a first and second bidirectional signal selectors for each of said K signals for each of said N matrix ports and an optical signal circulator connected between each pair of bidirectional signal selectors and said N signal processors, said optical signal circulator having at least three

connections and circulating an optical signal received at one connection out of the next adjacent connection on said circulator,

and wherein said signal delivery matrices further comprise a bidirectional broadcast coupler having a first side and a second side, each side having N coupler connections, one each of said coupler connections on said first side being connected to one first signal selector of each of said pair of signal selectors and one each of the connections on the second side being connected to one second signal selector of said pair of signal selectors, wherein an optical signal passing from either side of said bidirectional broadcast coupler to the other side of said bidirectional broadcast coupler is split into N parallel signals each of which is passed to each of said N matrix ports through a respective signal selector.

31. An optical switch as claimed in claim 30 wherein said bidirectional signal processors are active splitters including an optical amplifier wherein each of said split signals has a power equal to a predetermined power.

32. An optical switch as claimed in claim 30 wherein said power amplification is sufficient to permit each of said K signals to have a power similar to an input power level.

33. An optical switch as claimed in claim 32 wherein said optical amplification is achieved by an erbium doped optical amplifier.

34. An optical switch as claimed in claim 32 wherein said bidirectional signal selectors include a shutter array for selecting and deselecting predetermined wavelengths.

35. An optical switch as claimed in claim 30 further including a control system for controlling said bidirectional signal selectors.

36. An optical switch as claimed in claim 35 wherein said control system receives control information from a network, and utilizes said control information to control said bidirectional signal selectors.

37. An optical switch as claimed in claim 36 wherein said control information includes information about one or more of polarization, power and wavelength.

38. An optical switch as claimed in claim 35 wherein said control system includes a set of desired signal properties against which measured signal properties may be compared.

39. An optical switch having N switch ports comprising a switch architecture having K signal delivery matrices in which any signal received in any one of said N switch ports may be routed through any one of said K signal delivery matrices to any other of said N switch ports.

40. An optical switch having N switch ports for switching optical signals, said optical switch comprising a switch architecture connecting said N ports to permit a signal received in one of said N switch ports to be routed to any other of said N ports, and having at least one optical amplifier, wherein a signal may be switched and emitted from said switch at a predetermined power.

41. A method of switching optical signals through a switch having N switch ports comprising the steps of:

a) receiving a signal at one of said N ports; and then

b) dividing said received signal into K informationally identical signals; and then

c) selecting or deselecting signal components from one or more of said K like signals;

d) broadcasting said selected signal components to the other of said N switch ports; and

f) emitting said signals from said other N switch ports as desired.

42. A method of switching optical signals through a switch having N switch ports comprising the steps of:

a) receiving a signal at one of said N switch ports; and then

b) dividing said received signal into K informationally identical signals; and then

c) selecting or deselecting signal components from one or more of said K like signals; and then

d) providing said selected signal components to at least one other of said N switch ports; and then

e) combining said selected signal components with other selected signal components received at said one other of said N switch ports; and then

f) emitting said combined selected signal components from said one other of said N switch ports.

43. The method of claim 42 wherein each of said N ports simultaneously receives and emits signals.

44. The method of claim 42 further including a second step of selecting or deselecting said signal components at said emitting port.

45. The method of claim 42 further including a step of optically amplifying signals switched by said switch to a predetermined power level.